

**Oroville Facilities Relicensing Efforts
Environmental Work Group
Draft Narrative Reports for PM&E Discussion**

Resource Action: EWG-68B

Task Force Recommendation Category: 2

**ENHANCE RIPARIAN VEGETATION/SHORELINE VEGETATION WITHIN THE
FLUCTUATION ZONE OF LAKE OROVILLE**

Description of Potential Resource Action:

This Resource Action would enhance or create additional riparian vegetation and/or other native vegetation within the drawdown/fluctuation zone of Lake Oroville. This would include planting flood tolerant species, such as buttonwillow (*Cephalanthus occidentalis*) and willows (*Salix* spp.), as well as native herbaceous species such as perennial grasses and sedges (*Carex* sp.).

The following Resource Actions are either similar to or directly related to the proposed measure:

- EWG 26 – aims to improve shoreline habitat in Thermalito Afterbay.
- EWG 31 – involves warm water fish species habitat enhancement in Lake Oroville and includes construction of artificial reefs and/or planting flood tolerant vegetation in the fluctuation zone
- EWG 51 – involves riparian vegetation enhancement along the low-flow channel of the Feather River
- EWG 62 – enhances native plant communities in the Lake Oroville upland areas
- EWG 66 – involves the enhancement of riparian vegetation along the high flow channel of the Feather River

Nexus to Project:

Water level fluctuation in Lake Oroville hinders the establishment of riparian vegetation within the fluctuation zone.

Potential Environmental Benefits:

Currently, the reservoir shoreline is predominantly barren soil below the 900-foot full-pool elevation - the drawdown zone. Additional or improved vegetation within the reservoir drawdown zone could:

- Increase vegetation/wildlife habitat
- Improve aesthetic qualities along the reservoir shoreline
- Increase fish habitat complexity
- Enhance bass shoreline habitat
- Reduce shoreline erosion
- Reduce the need for shore stabilization structures

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Potential Constraints:

- Water supply and flood control drive the magnitude of Lake Oroville's water level fluctuation, not hydropower generation.
- Annual drawdown can be more than 100 feet during the course of a normal year. For a plant, the huge drawdown zone results in annual extremes of wet and dry root zone conditions—conditions to which most, cannot adapt.
- Prior to the construction of the dam, the majority of the drawdown zone supported mixed pine/oak woodland/chaparral vegetation or mixed conifer/hardwood forests. Hence, poor soils, steep slopes, and rocky substrates physically limit the number of sites that vegetation can colonize on its own or where enhancement efforts may be successful.
- Sites suitable for vegetation may be located in areas that are not easily accessed and therefore are more costly to plant.
- Shoreline erosion has reduced soil cover by an average of five feet within the fluctuation zone, further limiting the sites suitable for restoration.
- A large-scale increase of biological productivity in the reservoir may affect the management of the dam's water intake facilities. Detritus and other plant and animal material may clog intake facilities; additional maintenance may be required to keep them clear.
- Additional vegetation in the less steeply sloped areas may pose navigational and/or swimming hazards.
- Cultural resources may be present in sites suitable for planting.

Existing Conditions in the Proposed Resource Action Implementation Area:

Lake Oroville is located within the Sierra Nevada foothills. Vegetation around the lake, and that which historically occurred in the drawdown zone, consists of open woodland, forest and chaparral communities (Figure1). Native riparian habitats were and are restricted to thin strips along drainages, with cottonwoods, willows, occasional sycamores, and alders.

Figure 1: Vegetation in the Lake Oroville area



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Lake Oroville is a large reservoir with 167 miles of shoreline at its full pool elevation of 901 feet, with a surface acreage of 15,810 acres. The main reservoir's sides are steep and rocky, with very little soil, while the upper reaches of the reservoir are located in deeply incised canyons. Water within the reservoir can fluctuate more than 100 feet during the course of a "normal" year, with about 250 feet being the most it has ever fluctuated. Annually, the lowest water levels occur in the fall, the highest in late spring (the plant growing season). The 850' elevation defines the wet-year flood storage elevation, meaning in a wet year reservoir shore soils below this elevation are inundated year round. There are few sources of water to the reservoir shore during the drawdown period, due to lack of rainfall after mid-June. Springs and seeps do occur in scattered locations but are not common features of the area.

Most of the vegetation below the 900 foot elevation was removed prior to the filling of the reservoir. In these "vegetation retention areas", large woody debris such as trees and logs were left to provide macrocover for reservoir fisheries (Figure 2). Eighteen areas were designated totaling over 1100 acres. These areas have degraded over time, due to natural processes. The remainder of the shoreline is mostly barren with the exception of approximately 175 acres of sparsely vegetated shoreline with native willows (*Salix* spp.) and buttonbush (*Cephalanthus occidentalis*) (Figure 3a-3d). These occur mostly in that band between the 840- and 900-foot elevation (DWR 2003) and typically in areas where the slope is less than 15%. Although some of this vegetation has come in on its own, most was planted by the California Department of Fish and Game (DFG) and DWR. Since the 1970's, DFG and DWR fisheries scientists have planted cuttings and seedlings of native willows (*Salix*, spp.) and buttonbush (*Cephalanthus occidentalis*) at several locations in the 850' to 890' elevation range of the drawdown zone (Appendix A - Figure 4a-4h). Many of those willows are now over 20' high (EWG 31). Other herbaceous vegetation occurs sporadically within the drawdown zone. Some small drainages have a near year-round water supply and support various wetland/riparian species. A variety of non-native annual grasses and herbs occur sporadically after rains, but die back as the season progresses. Cocklebur (*Xanthium strumarium*), a native weedy species, was observed greening some slopes during the Fall of 2003, but not in sufficient densities to cover the brown and gray of the drawdown zone.

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Figure 2. Vegetation Retention Areas and plantings



Figure 3. Shoreline of Lake Oroville

a. barren gentle slope



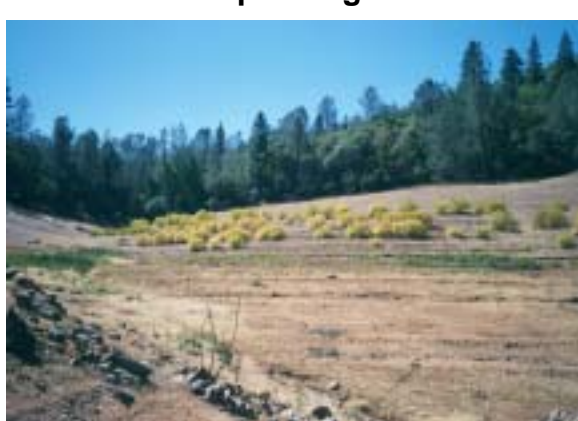
b. rocky shoreline



c. Bidwell Marina



d. buttonbush plantings



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Design Considerations and Evaluation:

Riparian species in this area typically are restricted to the relatively moist conditions along streams, rivers, lakes, or other types of wetlands. Seedling establishment usually requires a moist ground surface for seed germination and root development for development of a root system capable of following receding groundwater levels or soil moisture. Few species can withstand inundation for periods of time typical within the drawdown zone of the reservoir as well as the dry harsh conditions of summer and fall. Native willows (*Salix* spp.) and buttonbush (*Cephalanthus occidentalis*) can survive periodic inundation that is typical within the upper fluctuation zone above the 850 foot elevation. During wet years, vegetation below the 850 foot elevation may be inundated year round and stand little chance of survival.

Significant portions of Lake Oroville's shore are rock cliffs, which preclude any vegetation. Of the remaining area, willow and buttonbush survival is limited by local slopes and soils. Where slopes are gentle, soil moisture is retained longer during the critical growing season. However, this may not be enough to allow significant root growth for young trees. Watering the newly planted cuttings or saplings will greatly enhance the survival rate. This could be accomplished through an irrigation system or directly pumping from local sources (i.e. campgrounds, lake water, etc.) Based on previous experience of DWR fisheries biologists, 300 to 500 trees per acre should be used (EWG 31). Although the survival rate of cuttings is lower, a large number can be cut and planted in a small amount of time, local genetic stock is used, and no expense is incurred in purchasing the plants.

Herbaceous vegetation would also enhance aesthetic quality, wildlife value, and fisheries habitat within the fluctuation zone. Species of sedges (*Carex* sp.) and native grasses such as deer grass (*Muhlenbergia rigens*) could potentially be planted near drainages. Seed mixes with annual and perennial grasses as well as a selection of forbs could be planted in some areas to enhance the aesthetic quality of the fluctuation zone. Use of fertilizers should be discouraged, which could impact water quality and tend to encourage non-native weedy species.

All of the above plantings should be implemented in stages. Test plots and monitoring could be set up to test the success of individual species (or seed mixes) on different soils, slopes, and elevations.

Synergism and Conflicts:

There is a limited amount of acreage suitable for planting. Wildlife and fisheries enhancement efforts would be improved through riparian vegetation plantings. Although increasing biological productivity in the reservoir may affect the

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management of the dam's water intake facilities, it is unlikely that a large amount of biomass would be produced at the planting levels discussed above. Increasing the attractiveness of the reservoir for recreation and increasing human usage could affect water quality.

The goal of this resource action is to increase riparian vegetation, fisheries habitat and the aesthetic quality of the shoreline. Synergism could be created if this measure is planned in conjunction with other Resource Actions such as EWG 31 which aims to add structural complexity to the fluctuation zone for aquatic species, EWG 62 which enhances upland vegetation around the Lake, and any from the Land Use Work Group that enhance the aesthetic quality of the Lake Oroville shoreline and fluctuation zone.

Conflicts may arise if areas suitable for planting also contain important archeological resources. Sites suitable for planting may also be sites suitable for recreation or recreation-related structures.

Uncertainties:

Uncertainties include:

- number of acres that could support riparian vegetation
- success of planting woody and/or herbaceous native vegetation within drawdown zone
- weather patterns (drought, wet, or normal years) will influence degree of success or failure
- length of time necessary for manual watering to successfully establish plants

Cost Estimate:

Costs will vary depending on:

- planting method or methods used
- number of acres included in plan
- uncertainties in predicting success of species and planting methods
- number of years and rate of plantings per year
- decline in planting area over time

Willow and buttonbush plantings	\$ 3000
Irrigation (system or pumping to plant)	3000
Herbaceous planting (Carex, etc.)	1500
Planting of seed mix	3000
Monitoring	2000
Total per first year:	\$12,500

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Recommendations:

This resource action could be combined with EWG 31 (fisheries enhancement) and/or EWG 62 (upland habitat enhancement around Lake Oroville). Areas that currently have existing riparian species along the shoreline or along drainages above the 900 foot full-pool elevation could be enhanced. It is recommended that any plantings within the reservoir drawdown zone be restricted to native species to enhance native plant and wildlife habitats.

Literature Cited:

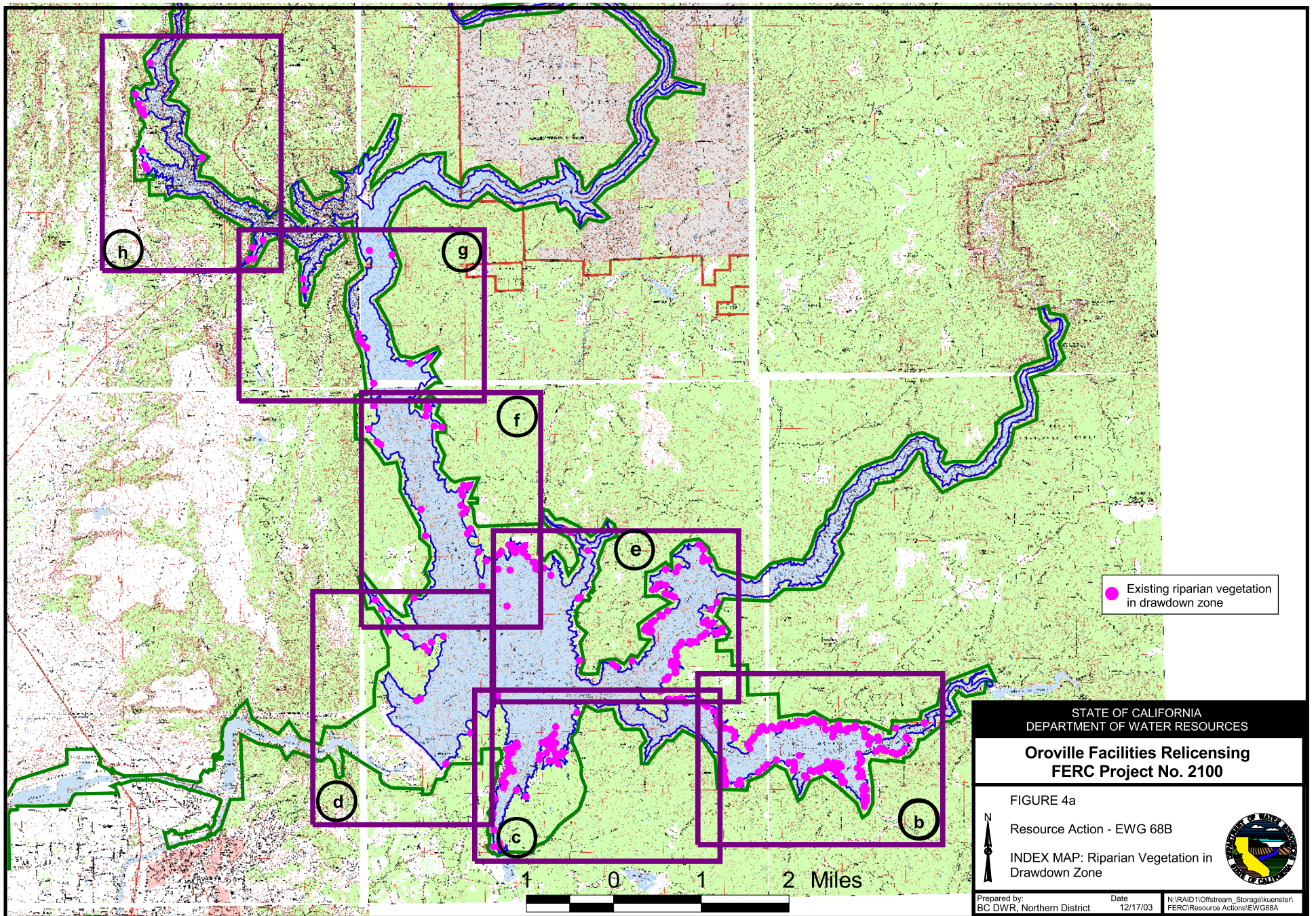
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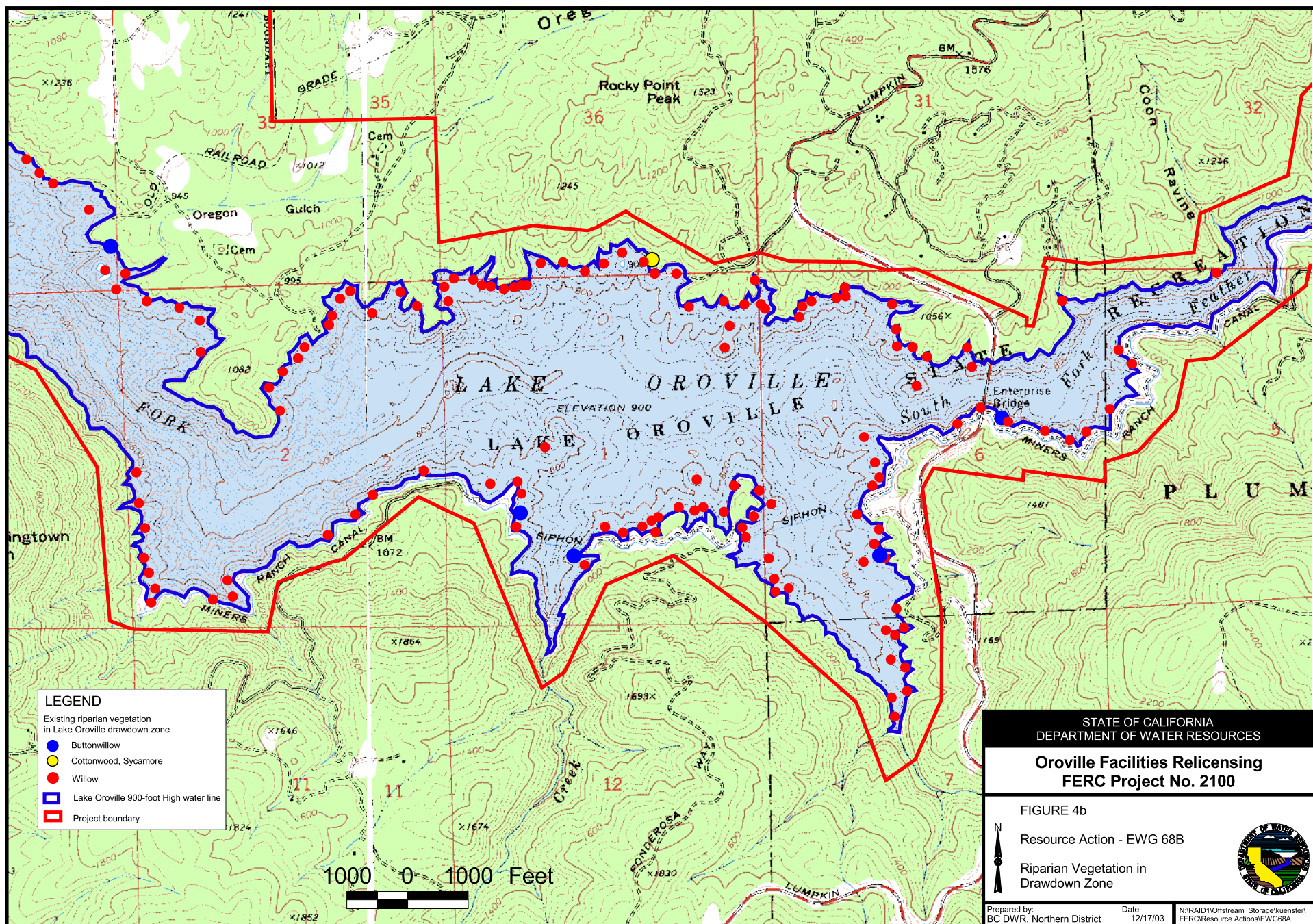
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APPENDIX A

**Figure 4 a-h - Existing riparian vegetation within
Lake Oroville drawdown zone**





STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

**Oroville Facilities Relicensing
FERC Project No. 2100**

FIGURE 4b

Resource Action - EWG 68B

Riparian Vegetation in
Drawdown Zone



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Date:
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